

REMARKS

Further and favorable reconsideration is respectfully requested in view of the foregoing amendments and following remarks.

The claims have been amended as follows:

(1) Polyisocyanate compound (A)

The polyisocyanate compound (A) in claims 1 and 15 is now specified to be at least one member selected from the group consisting of xylylene diisocyanate and hydrogenated xylylene diisocyanate, based on claim 4 and paragraph [0030] of the description.

Therefore, claims 2, 4, 16 and 18 are cancelled and claims 3 and 17 are amended to be consistent with amended claims 1 and 15.

(2) The swelling inorganic layered compound (ii)

Firstly, in order to distinguish the swelling inorganic layered compound (ii) from a filler mixture defined in Zilg et al. et al., Applicants use the expression “**consists essentially of**” for excluding mineral fillers which are essential in Zilg et al. et al. That is, Zilg et al. et al. use a filler mixture comprising organophilic layer silicates and mineral fillers (from page 1, the 2nd paragraph from the bottom to page 2, line 3).

Further, the swelling inorganic layered compound (ii) is defined by at least one member selected from the group consisting of “a smectite group clay mineral and a mica group clay mineral”, based on paragraph [0049] of the description.

(3) Polyamine (iii)

Moreover, in new dependent claims 24 and 25, the polyamine (iii) is also specified to be a urethane-modified polyamine compound, based on paragraph [0059] of the description.

Although Applicants disagree with the Examiner’s position in rejecting claim 22 under the first and second paragraphs of 35 U.S.C. § 112, this claim has now been cancelled, rendering both of the rejections of this claim under 35 U.S.C. § 112 moot.

Applicants respectfully submit that the foregoing amendments should be entered, even though they are presented after final rejection, since the effect of the amendments is to clearly place the application in condition for allowance, as will be apparent from the following remarks.

Double Patenting and Obviousness Rejections: Claims 1-23

(1) The Examiner's position

The Examiner rejects claims 1-23 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-11 of Uchida et al.(US '493 and US '533) in view of Zilg et al. et al. (WO 01/04193).

Further, based on the same logic, the Examiner rejects claims 1-23 for obviousness over Uchida et al. (US '493 and US '533) in view of Zilg et al. et al. (WO 01/04193).

These rejections are respectfully traversed.

(1-1) Double Patenting 1 over US '493 in view of Zilg et al. et al.

With respect to claims 1, 6 and 15, the Examiner alleges that although US '493 does not explicitly teach the use of a polyamine compound, Zilg et al. teach a filler mixture comprising a layered silicate such as montomorillonite (page 2, paragraph 2), treatment of swellable clays with swelling agents including aromatic amines and polyamines (page 2, paragraph 4), and use of a mineral filler with a thermosetting resin such as polyurethanes (page 6, paragraph 3), consistent with adding the polyamine to a dispersion of the inorganic layered compound.

Further, the Examiner asserts that Zilg et al. teach Jeffamine M, D or T series which are mono, di, triamine compounds such as Jeffamine D2000 (column 2, line 14 and column 8, lines 40-60); the function of the swelling agent in relation to the layered inorganic compound; the formation of nanocomposites; and the important role of polyamines because of their greater reactivity than polyols.

Finally, the Examiner asserts that it would be obvious to select the polyamine taught by Zilg et al. for use as the swelling agent for the layered inorganic compound.

With respect to claims 22 and 23, the Examiner asserts that the addition of polyamine to laminar clay is taught by Zilg et al.

(1-2) Double Patenting 2 over US '533 in view of Zilg et al. et al.

The Examiner alleges the obviousness-type double patenting of claims 1, 6 and 15 as well as claims 22 and 23 over US '533 in view of Zilg et al. et al. based on the same logic as in the Double Patenting 1.

(1-3) Obviousness of Claims 1-23 over US ‘493 or US ‘533 in view of Zilg et al.

Based on the same logic as in the above Double Patenting 1 and 2, the Examiner alleges the obviousness of claims 1-23 over US ‘493 or US ‘533 in view of Zilg et al.

(2) Cited References

(2-1) Uchida et al. (US ‘493 and US ‘533)

A detailed explanation of the Uchida et al. references is set forth in Applicants’ previous response.

(2-2) Zilg et al. (WO 01/04193)

Zilg et al. disclose the following:

Feature of the Invention

The features of the Zilg et al. reference reside in a filler mixture of organophilic layer silicates treated with a swelling agent and mineral fillers, and a nanocomposite containing the filler mixture.

“It has been found, surprisingly, that a combination of organophilic layer silicates and mineral fillers can yield considerably better mechanical properties than the individual components. In thermosetting resins, the addition of the filler mixtures --- results in a considerable increase in rigidity ---, while the substantial reduction in tensile strength --- is prevented. The filler mixtures according to the invention therefore allow the preparation of filled resins which, while having a relatively low filler content, have good mechanical properties and can be processed without problems. By varying the mixing ratio of mineral filler to organophilic layer silicate it is possible to obtain tailored system-specific property profiles.”(page 1, 2nd paragraph from the bottom)

“The present invention relates to **a filler mixture comprising an organophilic layer silicate** obtainable by treatment of a natural or synthetic layer silicate with **a swelling agent** selected from sulfonium, phosphonium and ammonium compounds (salts of melamine compounds and cyclic amidine compounds being excluded as ammonium compounds) **and a mineral filler** different therefrom.” (page 1, last paragraph to page 2, the first paragraph)
(Emphasis added)

Organophilic layer silicates

“As layer silicates for the preparation of the organophilic layer silicates of the filler mixtures --- there come into consideration especially natural and synthetic smectite clay minerals, more especially ---, hectorite, --- and montmorillonite. Montmorillonite and hectorite are preferred.” (page 2, 2nd paragraph)

Swelling agents

Zilg et al. exemplify polyamines as the swelling agent, and disclose a nanocomposite formed by polymerisation, polyaddition or polycondensation of the monomer.

“The sulfonium, phosphonium and ammonium compounds required as swelling agents for the preparation of the organophilic layer silicates are known and some of them are commercially available. They are generally compounds having an onium ion, for example trimethylammonium, ---, and a functional group that is capable of reacting or bonding with a polymeric compound. Suitable ammonium salts can be prepared, for example, by protonation or quaternisation of corresponding aliphatic, cycloaliphatic or aromatic amines, diamines, **polyamines** or aminated polyethylene or polypropylene glycols (**Jeffamine® M series, D series or T series**).” (page 2, 4th paragraph) (Emphasis added)

“The swelling agent brings about a widening of the interlayer spacing of the layer silicate, so that the layer silicate is able to take up monomers into the interlayer space. The subsequent polymerisation, polyaddition or polycondensation of the monomer or monomer mixture results in the formation of a composite material, **a nanocomposite**.” (page 4, 2nd paragraph) (Emphasis added)

Polymerisable monomers or polyurethane

“The invention therefore relates also to a composition containing
(A) from 20.0 to 99.5 % by weight of **a polymerisable or curable monomer or monomer mixture**, and
(B) from 0.5 to 80.0 % by weight of a filler mixture comprising an organophilic layer silicate obtainable by treatment of a natural or synthetic layer silicate with a swelling agent --- and a mineral filler different therefrom.” (page 5, 3rd paragraph) (Emphasis added)

“Suitable as component A are **monomers or monomer mixtures** that can be polymerised to form solid thermoplastics or polycondensed or polyadded to form crosslinked thermosets, either by irradiation or heating, optionally in the presence of initiators.” (page 5, 4th paragraph) (Emphasis added)

“Suitable components A are, for example, **the monomers** for the preparation of polyamides, vinyl polymers, polyesters, **polyurethanes**, polyphenylene sulfides, polyphenylene oxides, polyacetals, polycarbonates, polysulfones, polyether sulfones and rubber.” (page 5, 5th paragraph) (Emphasis added)

(Polyurethane precursors)

“Further preferred components A are polyurethane precursors. Structural components for crosslinked polyurethanes are polyisocyanates, polyols and optionally polyamines, in each case having two or more of the respective functional groups per molecule.

The invention therefore relates also to compositions comprising as component A a mixture of a polyisocyanate having at least two isocyanate groups and a polyol having at least two hydroxyl groups.” (page 10, 1st and 2nd paragraphs)

(Polyisocyanates)

“Aromatic and also aliphatic and cycloaliphatic polyisocyanates are suitable building blocks for polyurethane chemistry. Examples of --- polyisocyanates are --- (TDI) ---; --- (MDI) ---, may also contain polynuclear forms (polymer MDI); --- (NDI); --- and --- (HDI) and --- (isophorone diisocyanate, IDPI). Such basic types of polyisocyanates may optionally also have been modified by dimerisation or trimerisation with the formation of corresponding carbodiimides, uretdiones, biurets or allophanates.

Especially preferred polyisocyanates are the various methylene diisocyanates, hexamethyl-ene diisocyanate and isophorone diisocyanate. (page 10, 3rd and 4th paragraphs)

(Polyols)

“As polyols there may be used in the polyurethane production both low molecular weight compounds and oligomeric and polymeric polyhydroxyl compounds. Suitable low molecular weight polyols are, for example, glycols, glycerol, butanediol, trimethylolpropane, ---” (page 10, the last paragraph)

(Polyamines and Jeffamine)

“Polyamines also play an important role as components in the preparation of polyurethanes, especially because they exhibit greater reactivity than comparable polyols. As in the case of the polyols, both low molecular weight polyamines, e. g. aliphatic or aromatic di-and poly- amines, and polymeric polyamines, e. g. poly (oxyalkylene) polyamines, can be used.

Suitable poly (oxyalkylene) polyamines, --- are obtainable from polyether polyols, preferably have a molecular weight of from 1000 to 4000 and are also commercially available, e. g. under the name JEFFAMINE®, such as JEFFAMINE®D 2000, an amino-terminated polypropylene glycol of the general formula H₂NCH(CH₃)CH₂-[OCH₂CH(CH₃)]_x-NH₂, wherein x has on average the value 33, resulting in a total molecular weight of about 2000; JEFFAMINE®D 2001 ---; JEFFAMINE®BUD 2000, ---; or JEFFAMINE®T 3000, ---.” (page 12, 3rd and 4th paragraphs)

Nanocomposite

“The subsequent polymerisation, polyaddition or polycondensation of the monomer or monomer mixture results in the formation of a composite material, **a nanocomposite.**” (page 4, 2nd paragraph)” (Emphasis added)

“Various process variants can be employed for the preparation of the nanocomposites according to the invention: the swelling agent can be inserted into the layer silicate by cation exchange and the resulting organophilic layer silicate can then be incorporated as part of the filler mixture together with the mineral filler into the resin mass or into one of the components of the resin mass.” (page 13, 2nd paragraph)

“The invention relates also to a process for the preparation of a nanocomposite, wherein a composition comprising components A and B is solidified by curing or polymerisation of component A.” (page 13, 6th paragraph)

(3) Comparison of Claimed Subject Matter with Cited References.

“Consists Essentially Of”

One of the essential features of the Zilg et al. reference resides in a filler mixture comprising organophilic layer silicates and mineral fillers (see page 1, the second paragraph from the bottom, and the paragraph bridging from page 1 to page 2). That is, the mineral fillers

are an essential component for the Zilg et al. reference. Therefore, the claimed subject matter reciting the expression “consists essentially of” is clearly distinct from the Zilg et al. reference, since even if this reference were combined with the Uchida et al. references, the presently claimed subject matter would not be obtained. Accordingly, the obviousness-type double patenting rejections based on the Uchida et al. references in view of the Zilg et al. reference should be withdrawn.

Polyisocyanate (A)

Further, the Zilg et al. reference fails to teach a xylylene diisocyanate or a hydrogenated xylylene diisocyanate (see page 10, the third paragraph listing various polyisocyanates), recited in Applicants’ claims.

Polyhydroxyalkanecarboxylic acid (B)

The Zilg et al. reference also fails to teach polyhydroxyalkanecarboxylic acid (B) which is an essential component for preparing an aqueous polyurethane of the claimed subject matter as well as the Uchida et al. references. That is, the composition of the Zilg et al. reference, unlike the Uchida et al. references, is not aqueous, and thus it is unreasonable to combine the non-aqueous composition of the Zilg et al. reference comprising non-water-soluble or dispersible polyurethane with the aqueous composition of the Uchida et al. references.

Polyamine (iii)

All of the applied references fail to teach the urethane-modified polyamine recited in new claims 24 and 25.

Therefore, even if the Zilg et al. reference were combined with the Uchida et al. references, a person skilled in the art would not be motivated to achieve the subject matter of the claims.

Effects of the Claimed Subject Matter

According to the claimed subject matter, unexpected results can be obtained. That is, as apparent from Tables 1 and 2 of the present description, according to the claimed subject matter, 10-times or more improved gas-barrier properties than the Uchida et al. references can be provided.

Conclusion

For these reasons, Applicants take the position that the presently claimed invention is clearly patentable over the applied references.

Therefore, in view of the foregoing amendments and remarks, it is submitted that each of the grounds of rejection set forth by the Examiner has been overcome, and that the application is in condition for allowance. Such allowance is solicited.

Respectfully submitted,

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